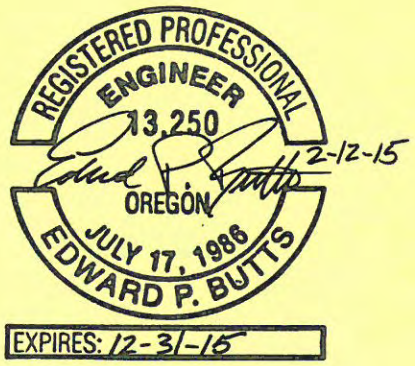
City of Independence
Independence, Oregon

Independence Oregon

Water System Master Plan Update
2015



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City of Independence
Independence, Oregon

Water System Master Plan Update 2015

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Glossary

Absolute Pressure (PSIA)	The pressure in a system after including the impact of atmospheric pressure (14.7 psi at sea level)
A.G.S.	Above Ground Surface, usually measured in feet above the local ground
ANSI	American National Standards Institute. A private, non-profit organization that oversees the development of voluntary consensus standards for products, systems, and services created within the United States. Often combined with ASTM as a dual standard, i.e. ANSI/ASTM
Aquifer	An underground and water bearing geological formation; in Oregon, viable aquifers usually consist of sand and/or gravel, basalt rock, and/or marine sediments (shale, sandstone, etc.)
ASTM	American Society for Testing and Materials. An international standards organization that develops and publishes voluntary consensus technical standards for 15 separate sections, including: iron and steel products, construction, and water and environmental technology equipment and processes used in the water supply field. Often combined with ANSI (ANSI/ASTM) to create a dual standard.
Average Day Demand (ADD)	The total amount of metered (delivered to customers) water in one full year divided by 365 or 366 in leap years
Average Summer Demand (ASD)	The estimated or actual average daily demand during 4 full summer months, typically June, July, August, and September.
Average Winter Demand	The estimated or actual average daily demand during 4 full winter months, typically the months of November, December, January, and February
AWWA	American Water Works Association: A water industry trade group that develops and publishes standards for equipment and chemicals used in the potable water supply industry.
B.G.S	Below Ground Surface, usually measured in feet
BHP or Brake Horsepower	The actual horsepower required to transfer a given volume of fluid, typically water, across a predetermined amount of total dynamic head (TDH), after allowance for the pump's efficiency. (@75% efficiency-1000 GPM @ 100' TDH requires 33.67 BHP)
Cubic Feet (ft^3)	1 cubic foot of water = 7.48 gallons. A measure of water volume, often used for water billing purposes. (100 cubic feet or 748 gallons = 1 unit)
C.F.S or CFS	Cubic feet per second, a measurement of rate of fluid flow (1 CFS = 448.80 GPM)
DEQ	Oregon Department of Environmental Quality. Responsible state agency for wastewater collection, treatment, and discharge as well as for air quality and solid waste disposal
EPA	Environmental Protection Agency, Federal government agency responsible for calculating, establishing, and enforcing national (U.S.) drinking water quality standards
Feet of Head (feet) (ft.hd)	An engineering unit of pressure, usually used to equate a vertical column of water to gauge pressure. 1 foot of water = .433 pounds per square inch (psi) of gauge pressure-2.31 feet of water = 1.0 psi of gauge pressure
Fire Flow	The maximum instantaneous flow of water, typically in GPM, and/or total volume, typically in gallons per day (GPD) or gallons (gal), that is required and/or delivered to a structure(s) or geographical area during the sustained fire event. Fire flow is generally expressed in the maximum flow or total volume required to suppress a large fire or group of fires over a period of several hours (usually, 2 hours to 1 day).
Friction or Head Loss	The impediment to flow from a fluid flowing through the interior surfaces of pipe walls, valves, and fittings. Varies with the flow and type and pipe size of the material used, i.e. PVC usually results in the lowest friction loss and steel has the highest. Measured in feet of head or psi loss.

F.P.S. or FPS	Feet per second, usually used to indicate water velocity in a pipeline. 5 FPS is generally recognized as the recommended maximum pipeline velocity.
Gauge Pressure (PSIG)	The value of pressure typically observed on and recorded from a standard pressure gauge without including the impact from atmospheric pressure.
GPCD	Gallons Per Capita per Day (AKA: gallons of water consumption or utilized per person per day) (See Per Capita Demand)
GPD	Gallons Per Day, a common measurement of water produced or sold
GPM	Gallons Per Minute, used as a common measurement unit of water flow rate
GR or G	GR=Ground water registrations before 1955 (Oregon) G=Certificate of registration for groundwater sources after 1955 (Oregon)
Groundwater	Naturally occurring water from a water bearing formation (aquifer) at depths ≥ 18' B.G.S.
Groundwater Act (Oregon)	In Oregon, a statute, adopted in 1955, that established water well contractor licensing, uniform water well construction standards and submission of well logs, and groundwater rights and permits.
HI	Hydraulic Institute: An independent organization that provides third-party testing and certification, as well as published standards, for pumping and hydraulic equipment in the United States.
HP, Horsepower	Horsepower-mechanical power necessary to perform work, typically used to calculate the work required to transfer a given volume of water against a given total dynamic head. 1000 GPM @ 100' TDH = 25 theoretical HP (THP). Actual or "Brake" HP (BHP) is usually 20-60% higher than the theoretical value due to the pump efficiency; i.e. 25 THP≈30-40 BHP.
Independence, City of Independence	City of Independence including all water customers supplied and billed from the city as well as city owned wells, pumps, water storage tanks, and distribution systems.
IPS	International Pipe Size, a classification of standard pipe sizes between ½" up thru 12". Pipe sizes in this classification are intended to match the outside diameter (OD) of standard steel pipe.
L&L	Leakage and Loss; the ratio difference between the total water produced from the source and the metered or sold water delivered to customers. Generally a percentage figure that varies from different water purveyors between 5% (.05) up to 20% (.20). The goal for most water systems is to maintain an L&L ratio of less than 10% (.10).
Maximum Day Demand (MDD)	The maximum actual or projected daily water consumption in a given year. Source capacity and storage requirements are frequently based and sized on this demand along with the fire flow. This combination is frequently used for hydraulic models.
MCL/MCLG/mcl	Maximum contaminant level-Max. allowed level of a given contaminant set by the EPA MCL goal =desired maximum level of a contaminant
Metered (or Sold) Water	The rate or volume of water delivered (and thus, metered) to customers through service connections and water meters. The difference between the "Production" and "Metered" volume of water is considered as unaccounted for or loss water and is not directly compensable. (See definition of L&L above).
MG/L or mg/L	Milligrams per liter; concentration of a mass of a chemical or contaminant per unit volume of water, roughly equal to 1 part per million (1 lb. per million lbs. = 1 mg/L)
MGD or mgd	Million gallons per day (1 MGD = 694.44 GPM or 1.55 CFS)
MSL	Mean Sea Level-elevation above or below normal sea level (usually expressed in feet)-often established by the USGS
NA or N/A	Not applicable, none available
ND or N/D	None detected or non-detectable level of an individual contaminant, chemical, element, or compound (mostly used in water quality tests)

NSF	National Sanitation Foundation; an organization that provides third-party testing and certification of water system components and chemicals. NSF standards 60 (components) and 61 (water treatment chemicals) are used in Oregon as the minimum levels of compliance, per OHA.
OHA or Health Authority	Oregon Health Authority, responsible state agency for the regulation of Public Water Systems in Oregon-Formally known as the Oregon Health Division (OHD)
O.D. (Outside Diameter) I.D. (Inside Diameter)	A cross-sectional measurement of a pipe's outside diameter (OD) or inside diameter (ID). Often used to distinguish a pipe types pressure rating or classification (Example Class 100 = 100 psi pressure rating).
Peak Hour or "Peak" Demand	The maximum instantaneous flow rate of water within a water system anticipated to occur at any one time in a given year, often expressed in gallons per minute (GPM). This value or the maximum day demand with fire flow often determines the source and pumping equipment, water storage, and/or the distribution system sizing and layout.
Per Capita Demand (aka GPCD)	The rate of water consumed or used by a single person per day, expressed in gallons. Can be applied to average, maximum day, or peak hour demands
PSI (psi)	Pounds per square inch, a unit measurement of applied pressure. Note that 1 PSI = 2.31 Feet of water head; 100' of water head = 43.3 psi; 100 psi = 231 feet; Also, See Feet of Head
Production	Used to distinguish the total rate or volume of water delivered from the sources and storage from the total rate or volume sold or delivered to customers. Used for average day, maximum day, and peak hour observations.
Pumping Water Level (PWL)	The stable distance from ground level downward to the lowest water level in a water well during sustained pumping conditions, usually measured in feet B.G.S.
SCADA	Supervisory Control And Data Acquisition. An acronym used to describe an automatic control and data collection system. Often referred to as "telemetry".
Static Water Level (SWL)	The distance from ground level downward to the highest free standing water level in a water well that is not presently under pumping or "static" conditions, usually measured in feet B.G.S.
TDH or T.D.H.	Total Dynamic Head (in feet)-Sum of the vertical lift (lowest water surface to the upper water surface or from the source to point of delivery) plus all delivery pressure, and the sum of all pipe, valve, and minor friction losses.
Unit	Used to determine a total volume of water, often used for billing purposes (Typ. Value: 1 unit = 748 gallons) (or 100 cubic feet)
USGS (U.S.G.S.)	United States Geological Survey
Well, Water Well	An artificially created (usually vertical and cylindrical in shape) opening or shaft constructed at and below ground level for the purpose of locating and extracting water. A deep water well is usually defined as a well greater than 20'-30' in total depth.
WRD/OWRD	Oregon State Water Resources Department, State agency responsible for water well construction standards, water well contractor licensing, and water rights appropriations

Executive Summary

Executive Summary

General

This Water System Master Plan Update for the City of Independence outlines the water system improvements and expansions necessary to accommodate the anticipated growth and correct the current deficiencies. This update was developed as a supplementary and complimentary addition to the 1997 Water System Master Plan (Stettler Company, Salem, Oregon) and the 2007 Water System Master Plan Update (4B Engineering & Consulting, LLC). Unless otherwise stated, the data and conclusions within this updated report supersedes and replaces all previous reports from 1997 and 2007. The time span of this study is 20 years outlining the projected needs of the city's water system from Year 2015 to 2035, inclusive.

Scope of Study

A well prepared water system master plan will evaluate several factors. Among these are: the projected 20 year population growth, adequacy of existing sources, evaluation of water quality parameters and impact due to water source and regulatory changes, distribution system adequacy for varying water demands, the current and future water storage and booster pumping requirements, capital improvement funding requirements and an implementation schedule.

Existing Water System

The existing water system obtains all of its source water exclusively from nine individual groundwater wells with two of the wells currently inactive. Five of these wells including the two inactive wells, are grouped together in a well field commonly referred to as the South Well Field. This well field is located in the southeastern area of Independence, between River Oak Road and an existing set of railroad tracks that run North-South through the city. The combined maximum yield from this well field is 500 GPM although the wellfield typically produces approximately 400 GPM. The remainder of currently available source water is obtained from the four (4) wells located in and adjacent to the Polk Street Well Field. All source water is pumped from the four individual wells and combined to deliver water directly to ground level storage reservoirs with adjacent booster pump stations that repressurize water to the city. The South Well Field delivers water to the adjacent South 1,500,000 gallon reservoir while the Polk Street Wellfield discharges water to two remote reservoirs at the Polk Street site with a capacity of 750,000 gallons each, or 1,500,000 gallons total. A third site, the Monmouth Street 750,000 gallon reservoir/booster pump station, is automatically refilled from the pressurized water system and returned to the water system using up to two (2) booster pumps with a firm combined capacity of 2000 GPM. The Polk Well Field consists of four wells: Polk Wells 1-3 and the River Drive well and the current (2015) maximum combined source capacity at this site is 1000 GPM. The South Booster Pump Station uses four (4) booster pumps with a firm capacity of 2,130 GPM. The Polk Booster Pump Station utilizes three (3) booster pumps with a firm combined capacity of 3,100 GPM.

The maximum combined booster pump capacity (from all sites) is approximately 7,000-8,500 GPM (depending on discharge pressure). The only water treatment currently performed is the use of gaseous chlorination to control coliform bacteria and sodium fluoride injection at the South and Polk Wellfields. (Well logs, well pump data and curves, water rights data, and booster pump data and curves can be found in the Appendix of the 2007 Master Plan Update).

Population Projections

In 2014, the City of Independence had an estimated population of 8,605 (Source: Portland State University, Center for Population Research). Due to the recent inclusion of a new apartment complex in Northeast Independence, the 2015 population of the city is now estimated to be 8820, an increase of 215 residents in one year. Because of presently projected, confirmed, and/or planned development, the City's population is projected to increase to 14,450 by the year 2035, an average growth rate of 2.5% per year. The vast majority of the city's growth is expected to occur from new residential development.

Water Requirements

The City's current (2014) average daily production of water is approximately 850,000 gallons per day; this equates to a typical per person usage of 98.7 gallons of water per day which includes all water lost through system leakage and loss (L&L). This value of per capita water consumption is typical for a city of this size and population distribution. The most recent (2014) average summer day demand is approximately 1,250,000 gallons per day or 145 GPCD, an increase of 47% over average day values. Current maximum day water demand is approximately 2,000,000 gallons, an increase of 2.35 times the average day demand. The maximum day demand typically occurs in July or August. System leakage and non-revenue water is currently averaging 20%, higher than the desired range of 10%-15%. The distribution of water usage in the city is approximately 75% for residential (all types) usage, and 25% for commercial/industrial use. The current available water sources can provide water for all anticipated average daily demands but as the city continues to grow, the ability of the existing wells to accommodate the increased summer and maximum day demands will be strained.

Future Water Requirements

Planning values have been set to an average per capita water use of 110 GPCD with typical summer day values at 150 GPCD, an increase of 36% over the planned average day values, with maximum day per capita demands set at 225 GPCD, an increase of 204% over average day demands. The average daily water demand in 2035 is projected to rise to around 1,600,000 gallons per day (1,481 GPM), with typical summer day demands averaging 2,100,000 gallons per day (1,944 GPM) and maximum day demands averaging as high as 3,200,000 gallons (2,424 GPM) by the year 2035 (end of the study period) based on a maximum well operation of 18 and 22 hours per day, respectively.

Source of Supply

The City currently derives all source water from groundwater sources with total groundwater rights of 2803.4 GPM, well above the current needs. Although the city has procured future surface water rights from the Willamette River for up to 2000 GPM (4.46 CFS), future planning has been performed throughout the 20 year study period assuming the exclusive use of existing and additional groundwater sources. This consists of additional flow from the Polk Wellfield, re-addition of South Wells #4 and #5, and the eventual implementation of the Willamette River Wellfield, a cooperative venture between the City of Monmouth and City of Independence that was developed during the late part of the 2000-2010 decade which resulted in three (3) water wells with a combined yield of 1200 GPM. Significant well testing and water quality analysis has concluded that this source will be classified as "Groundwater under the direct influence of surface water" or "GUIDI". This will necessitate the use of filtration and enhanced disinfection (ultra-violet light) before chlorination and use as a potable water supply. Current plans call for the City of Monmouth to operate the treatment facilities and then deliver up to 500 GPM of treated water to Independence via a new dedicated transmission main where the water will then be blended with water from the South Wells and then chlorinated for ultimate use from the South Water Storage Reservoir/Booster Pump Station. The eventual (Year 2035) allocation of water is projected to be 1,050 GPM from the South/River wells and up to 1,450 GPM from the Polk/River Drive wells, or 2,500 GPM (3.60 MGD) total.

Peak Water Demand

As this water system is a "closed-loop" water system with no appreciable gravity water storage available, the system must be designed and capable of directly delivering (by booster pumping) all conceivable water demands, from the nighttime, low level demands in the winter months to the highest peak demands and fire flows that could occur during the hot summer months. Careful analysis has resulted in the conclusion that the existing booster pumping capacity is sufficient and with adequate versatility and redundancy for all current and future projected water system demands. The total estimated system pumping capacity is 8,400 GPM at 50-55 psi with reservoirs at a "full" or near full condition and all booster pumps operable. The capacity used for this study, however, was 7,230 GPM @ 60-65 psi (assumes reservoirs at a 50% full state or the loss of one booster pump with full reservoirs).

Water Quality Considerations

Since the City of Independence currently uses groundwater supplies exclusively, recent modifications to the Safe Drinking Water Act that primarily impact surface water supplies will have little or no impact to the city. However, even that luxury will not allow the city to escape the regulatory requirement to monitor for almost 100 potential contaminants. Monitoring requirements for inorganics synthetic and volatile organic contaminants represent an expensive and time consuming task for all water systems, including the City of Independence. Currently, the greatest water quality concerns for

Independence are the control of coliform bacteria at the Polk wells and in the water system, monitoring and treatment of known organics (Tetrachloroethylene (PCE) and Pentachlorophenol) present within the South Well Field, adequate treatment of water from the future Willamette River Wellfield, and iron bacteria control within all of the wells.

Water Storage

The present available water storage of 3,750,000 gallons is adequate for the current water demands and population. This total consists of 1,500,000 gallons at the South Reservoir site, 750,000 gallons at the Monmouth Street site, and 1,500,000 gallons (using two (2) 750,000 gallon reservoirs) at the Polk site. The projected future deficit in storage will be satisfied by the year 2025 with the addition of a second 1,250,000 gallon reservoir planned for placement at the existing South reservoir/pump station site, adjacent to the existing 1.5 million gallon reservoir. This will provide a total of 2,750,000 gallons of water storage at this site alone. Water storage is typically planned for operational storage, fire flow, and reserve (emergency) purposes. Fire demand and operational storage are generally known and predictable values while the volume required for reserve water storage is based on a judgment of the vulnerability of the exposure of the water system to emergencies, such as power failures, equipment and/or source failure, and other salient factors. In this case, 2.25 days of reserve water storage at average day conditions is planned. Total anticipated water storage volume in Year 2035 is 5,000,000 gallons.

Hydraulic Analysis

Computer modeling indicates that the water distribution system is hydraulically balanced and can accommodate most of the normal water system demands, including the current and future average, maximum day, and peak hour flow demands. Fire flow capacity (up to 4000 GPM) for specific areas such as the downtown core area (Monmouth/Main Street area) and Central High School is also available and adequate, based on present and future pipeline and booster pumping system capabilities, population, and configurations.

Capital Improvement Program

Specific improvements have been divided into four phases of work. This will allow improvements to occur commensurate with the system growth and available funding. Phase I improvements cover the years 2015-17 and includes a parallel 8" transmission main from the Polk wells to the Polk Reservoir, an expanded iron/manganese filtration system at the Polk Reservoir/Pump Station site, and a standby generator at the Polk wellfield. Phase I improvements are estimated to cost a total of $795,625.00 which will, by themselves lower the pump head enough to increase the system source flow by 400-500 GPM as well as improve overall reliability of the Polk Wellfield. Phase II work covers the years 2017-20 and includes a new pipeline extension from the South Booster Pump Station to the distribution grid, an engineering study, and reactivation of the

overhead reservoir, beginning of a system-wide water meter replacement program, and a pilot study for the Willamette River Wellfield, and is estimated to cost $401,875.00. Phase III improvements (2020-2030) allow for an additional 1.25 MG of water storage at the South Reservoir/Pump Station site, waterline replacements, upsizing of a booster pump at the South Booster Pump Station, and 50% of the costs needed for employing filtration and UV disinfection for the Willamette River Wells. Phase III is estimated to cost $1,903,563.00. Phase IV is a variable scope of work that covers the entire planning period for replacement of city waterlines as funds and priority exist (2015-2035) for a total cost of $2,970,000.00. Total cost for all phases of work is $6,071,063.00 (2015 dollars).

Chapter One

Introduction

Introduction

Background

The City of Independence, Oregon is the third largest established urban area in Polk County. The City is located in the central Willamette Valley, approximately twelve miles southwest of Salem on the west bank of the Willamette River (between River Miles: 94-95). The climate is characterized by typical Willamette Valley weather conditions with moderate temperatures, wet winters, and dry summers. Rainfall averages 40-45 inches per year with the majority occurring between the months of November through March. Prevailing winds are generally directed from the south and southwest. Historically, the economy of the area has been supported largely by agriculture and wood products. The Willamette Valley has recently seen an increase in population due to the influx of new residents and Polk County and Independence has each been a beneficiary of this trend. This Water System Master Plan Update reflects the results from a current review and update of the Independence water system's infrastructure, recent population growth and future projections, and updating of the Capital Improvement Plan. This Update is intended to be a complimentary and supplementary document to the original City of Independence Water System Master Plan-1997 (Stettler Company, Salem, Oregon) and Independence Water System Master Plan Update-2007 (4B Engineering & Consulting, LLC, Keizer, Oregon) although the data and recommendations contained here in supersedes that in both prior reports. Much of the background and basic information related to the city and water system can be found in the original 1997 Water System Master Plan or the 2007 Update.

Water System History

The recorded history of the water works for the City of Independence dates back to 1887. During that year, the City completed construction of its original water system. The original water system consisted of 13,000± feet of water main, a 20,000 gallon elevated cistern, and a windmill. In 1888, due to the inadequacy of the windmill's capacity, a steam-driven pump was installed. This pump had a capacity of 6,200 gallons per hour and delivered water to all city residents and commercial customers. In 1906, a private company, Mountain States Power Company, assumed control of the water system and thereafter operated it until 1954 when Mountain States merged with Pacific Power and Light (PP&L). PP&L continued to operate the system and perform various water system improvements from 1954 until 1984 when the City of Independence assumed control.

During the mid-1950's, a new well field (South Well Field) was developed as well as a 300,000 gallon storage reservoir and 1500 GPM booster pump station at the Main Street site, current site of the Independence Civic Center and City Hall. Considerable lengths of new water lines, mostly consisting of wrapped O.D. steel pipe, were also installed during this period. In the mid-1970's a new 750,000 gallon steel reservoir and booster pump station (capacity ≈ 1000 GPM) was constructed adjacent to the PP&L Monmouth Street substation site. In 1983, a study was performed to determine the feasibility of the transfer of the water system from PP&L to the City of Independence. Following the favorable results

of the study and an election by city residents, the water system was offered for purchase to the City in April, 1984. On November 1, 1984, the entire water system was purchased, transferring ownership from PP&L to the City of Independence. Since that time, the City has embarked on various improvement projects needed to accommodate growth and replace obsolete and undersized facilities. Among these were the reactivation or construction of three new wells between Years 1990-94 in the Polk wellfield, a 750,000 gallon reservoir/pump station facility in 1992 (Polk), and a pipeline replacement project in 1994. In 2003-04, the primary reservoir and booster pump station used by the city (Main Street Reservoir/Pump Station) was relocated and replaced with a new 1.5 million gallon reservoir and 2500 GPM booster pump station at the South wellfield. In 2011, the city repaired the existing 750,000 gallon reservoir and added a second 750,000 gallon reservoir at the Polk Site.

Authorization

Preparation of this Master Plan Update was authorized by the City of Independence on July 26, 2012. The delay associated with the completion of this update was predicated on the collection of adequate data of population, water consumption, and production.

Scope of Study

The primary purpose of this Master Plan Update is to update the previous 2007 Master Plan Update using the current population, water system configuration, and water use trends and figures, in addition to an evaluation of allowable growth in specific areas. The scope of study and planning includes the following specific items:

1. Evaluate the existing water sources, distribution system, booster pumping, and storage facilities to determine the relevant adequacy and reliability.
2. Address appurtenant water quality and water rights issues affecting existing and potential sources.
3. Perform an updated hydraulic analysis using computer modeling of the existing distribution system to determine the inadequacies and degree and scope of correction required.
4. Evaluate existing storage and pumping facilities for average day, maximum day and peak hour adequacy and determine additional storage and pumping capacity needed to accommodate the present and future water demands. Determine the availability of fire protection flow and duration.
5. Prepare a revised and updated Capital Improvement Plan, including cost estimates for necessary system improvements along with a proposed timetable for implementation.

Time Span of Study

This Master Plan Update evaluates and estimates the needed improvements between the years 2015 to 2035, inclusive. Many of the proposed improvements are recommended between years 2015-2025 due to the potential inadequacy of existing source capacity. Specific improvements may be delayed or accelerated

depending on actual system growth, regional or localized growth areas with specific expansion requirements, funding considerations, and the City Council direction.

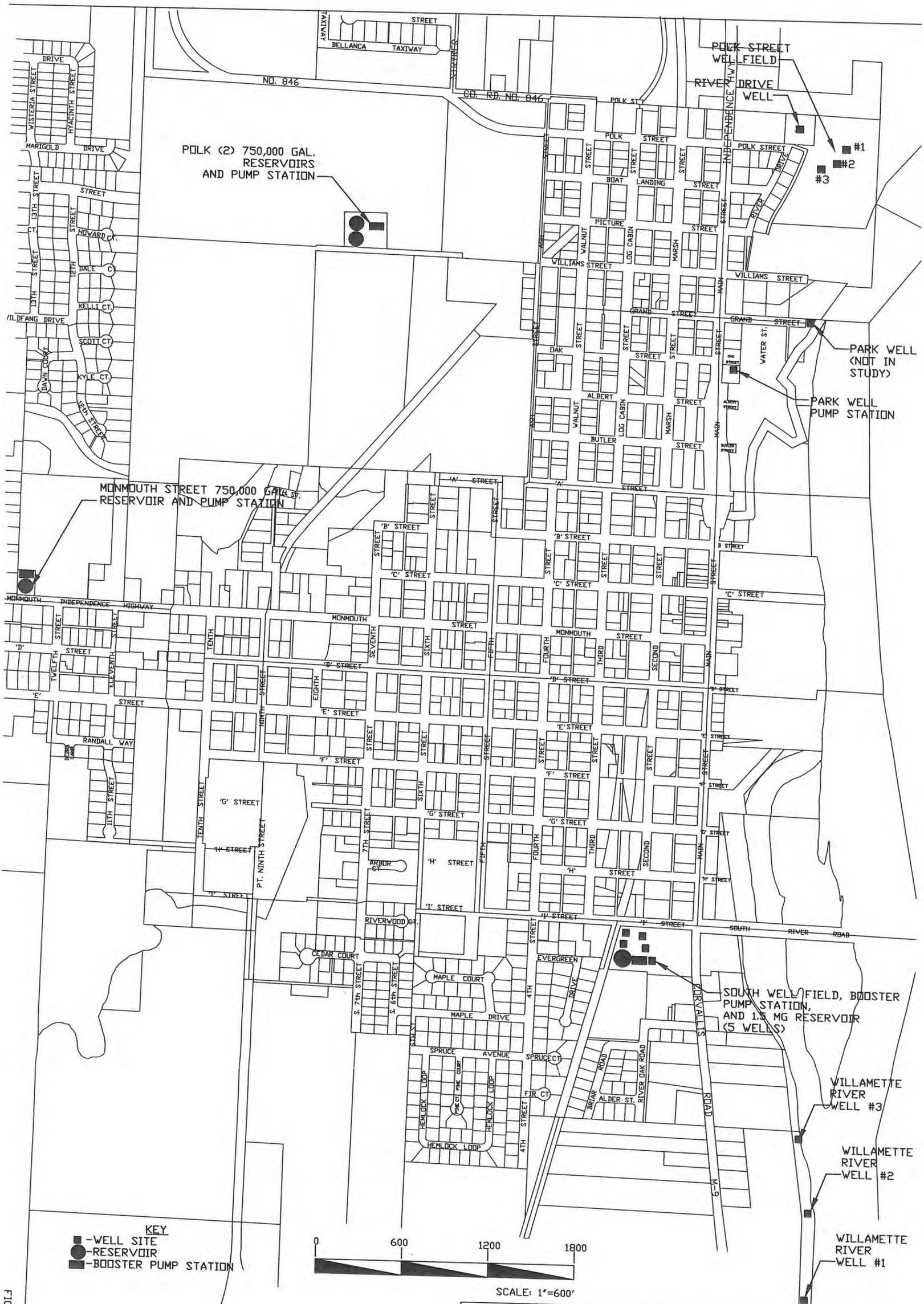


FIGURE 1-1

CITY OF INDEPENDENCE
STREET MAP &
WATER SYSTEM SITES
INDEPENDENCE, OREGON

4B ENGINEERING & CONSULTING, LLC
3700 RIVER ROAD N, SUITE 2
KEIZER, OREGON 97303
(503) 589-1115

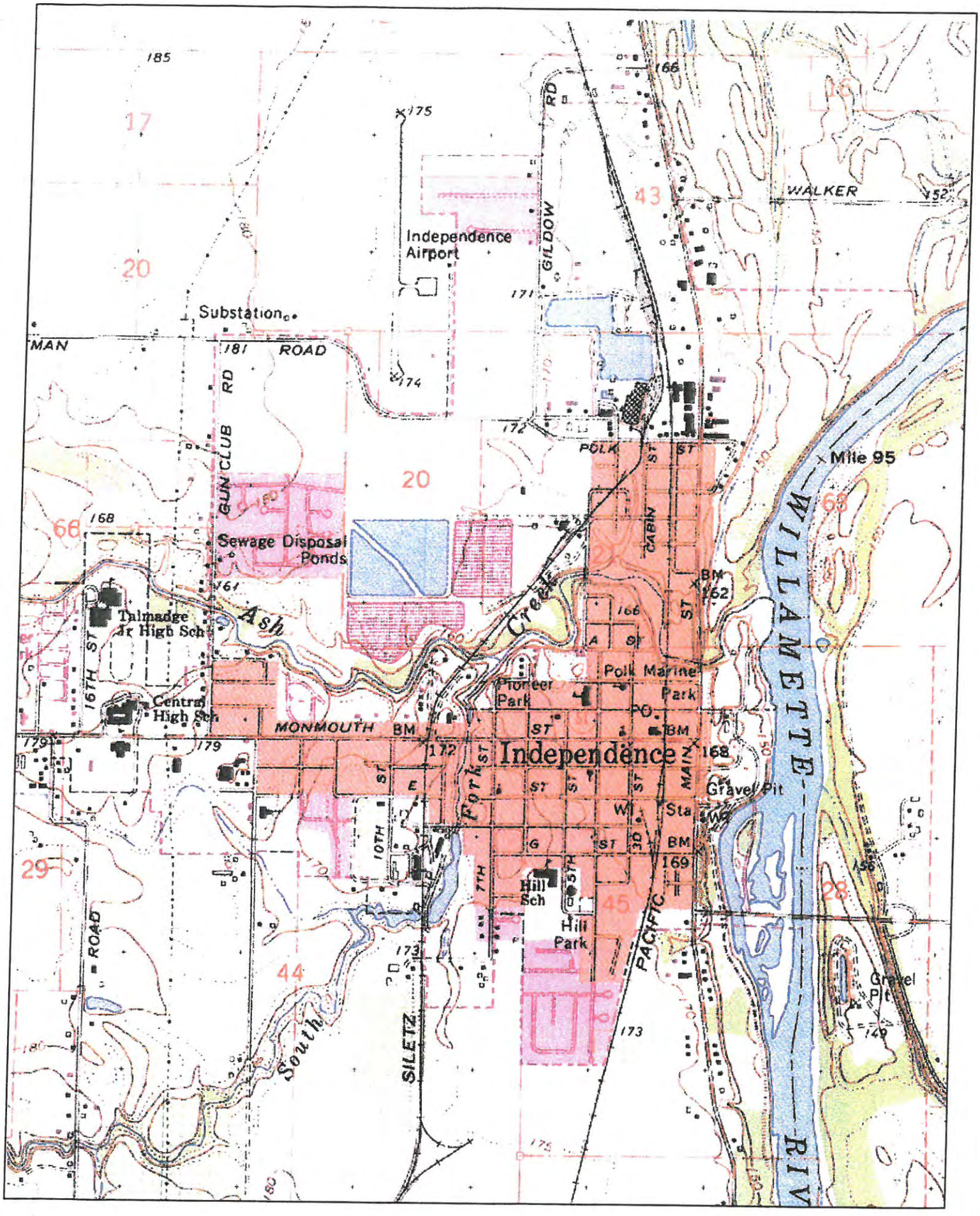


FIGURE 1-2
USGS MAP

INDEPENDENCE

CITY OF INDEPENDENCE
LOCAL FLOOD ZONES
FIGURE 1-3

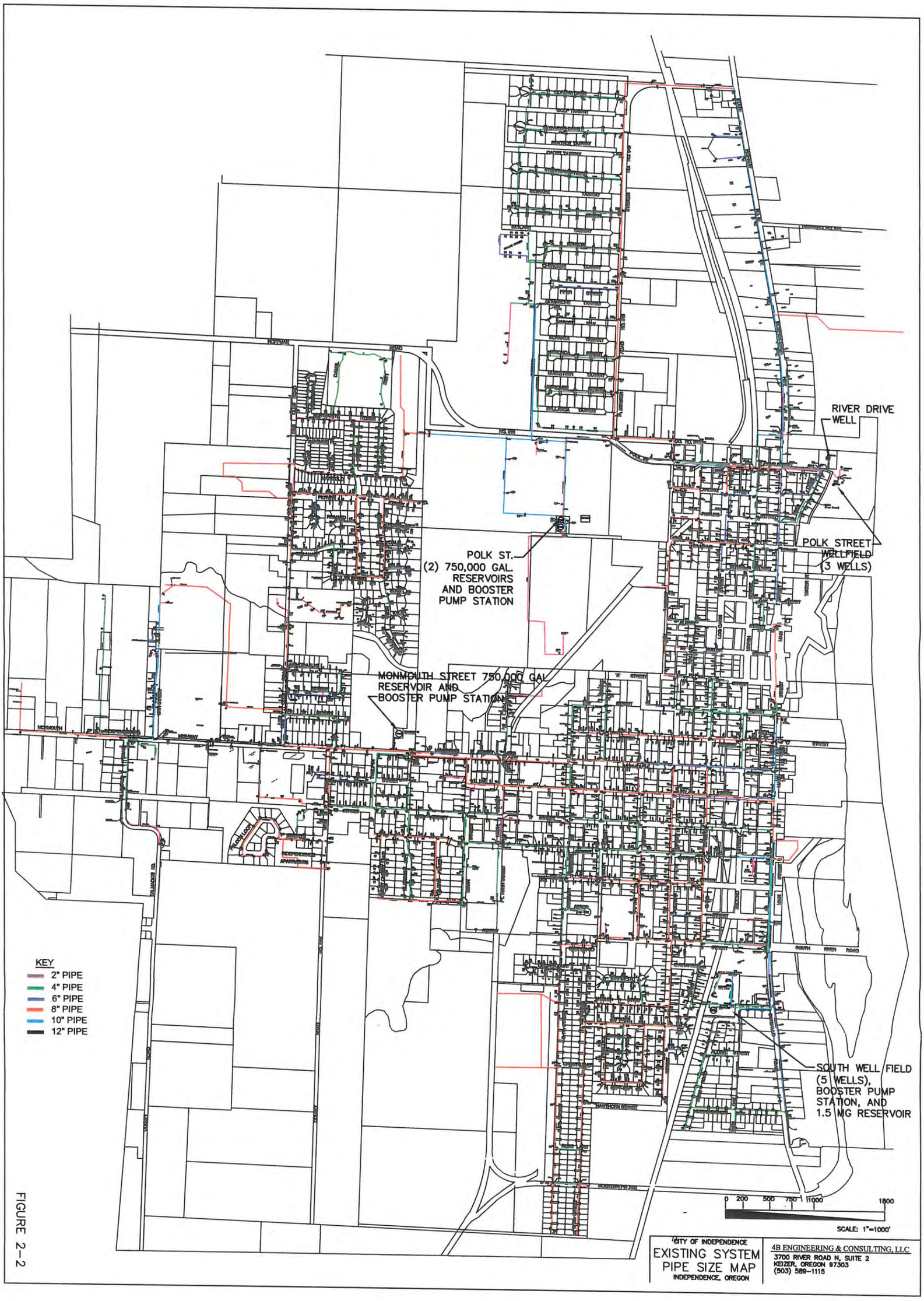

RIVER DRIVE WELL
POLK STREET WELLFIELD (3 WELLS)
POLK ST. (2) 750,000 GAL. RESERVOIRS AND BOOSTER PUMP STATION
MONMOUTH STREET 750,000 GAL RESERVOIR AND BOOSTER PUMP STATION
SOUTH WELL FIELD (5 WELLS), BOOSTER PUMP STATION, AND 1.5 MG RESERVOIR
KEY
2" PIPE
4" PIPE
6" PIPE
8" PIPE
10" PIPE
12" PIPE
0 200 500 750 1000 1800
SCALE: 1"=1000'
CITY OF INDEPENDENCE
EXISTING SYSTEM PIPE SIZE MAP
INDEPENDENCE, OREGON
4B ENGINEERING & CONSULTING, LLC
3700 RIVER ROAD N, SUITE 2
KEIZER, OREGON 97303
(503) 589-1115

FIGURE 2-2

Chapter Two

Existing System

Existing System

Groundwater Sources

The City currently has access to seven individual groundwater wells at two separate well fields with two additional wells currently held in an inactive state (two in the South wellfield). Three of the active wells are located at the South Well Field and four at the Polk Street wellfield site. All of the wells that supply water to the City are constructed in either "younger" (Polk Wellfield) or "older" (South Wellfield) unconsolidated alluvium (sand and gravel) formations (aquifers). The original South Wellfield (3 wells) was developed during the mid-1950's and the 3 wells were replaced in 2006 with two additional wells added in 1992. The Polk Wellfield originally consisted of four wells drilled in the late 1950's by PP&L. One well (Well #1) was reconfigured and is now in use; another well in the lower wellfield (Well #2) was abandoned in the 1990's, the remaining two (2) wells (River Drive #1 and #2) are described below.

Table 2-1
Well Data

South Well Field

Well Number	Year Drilled (Replaced)	Diameter	Depth	SWL	Perforations or Screened	Seal Depth	Seal Material	Current Production Capability
South Well #1	2006 (Replaced)	8"	95'	31'	60'-82' (perf)	0'-34.5'	Cement	133 gpm
South Well #2	2006 (Replaced)	8"	80'	31.3'	50'-66' (perf)	0'-34'	Cement	133 gpm
South Well #3	2006 (Replaced)	8"	80'	30.7'	50'-66' (perf)	0'-34'	Cement	133 gpm
South Well #4 (Inactive)	1992 (New)	8"	80'	50'	55'-73' (perf) 74'-77' (perf)	0'-26'	Cement	75 gpm
South Well #5 (Inactive)	1992 (New)	8"	80'	49'	55'-74' (perf)	0'-26'	Cement	75 gpm

Polk Street Well Field

Well Number	Year Drilled	Diameter	Depth	SWL	Perforations or Screened	Seal Depth	Seal Material	Current Production
Polk Street #1 (Original) (Modified)	1957 1990	16" 12"	50' 51'	18' 19'	20-45' (perf.) 22'-45' (perf)	None 0'-20'	None Cement	1200 gpm 350 gpm
Polk Street #2 (New Well)	2001	20" (0'-19' 12" (19'-57')	57'	24'	26'8"-46'8" (screened)	0'-19'	Bentonite/ Cement	350 gpm
Polk Street #3 (New Well)	2006	12"	52'	14.67'	22'-32' (screen) 32'-42' (screen)	0'-20'	Cement	500 gpm
River Dr. Well (New Well)	2000	8"	61'	26'	35'-50' (perforated)	0'-18' 61'-70'	Bentonite	50 gpm

Additionally, the City technically owns two existing, but inaccessible and undeveloped, wells on River Drive that were a part of the PP&L well development program in the late 1950's and were previously tested for capacity in 1995. Although the city technically "owns" these two wells, they are located on property not currently owned by or under City control and are therefore not available to the

City for public use. In order to protect the water quality of the operating wells within the Polk Wellfield the city is advised to take the steps necessary to insure these two inactive wells are properly capped or abandoned.

Well Number	Year Drilled	Diameter	Depth	SWL	Perforations	Seal Depth	Seal Material	Typical Production
River Drive #1	1958	16"	68'	31'	30'-55'	None	None	125 GPM
River Drive #2	1958	16"	67'	32'	32'-65'	None	None	100 GPM

Water Rights

The City of Independence currently (2015) has approved and active permits or certificates for the following groundwater and surface water sources with the Oregon Water Resources Department (ORWD):

Table 2-2
Water Rights

Source Associated With	Application No.	Permit/ Claim No.	Certificate or Transfer No.	Priority Date	Permitted Flow
South Well #1	NA	GR-3183	GR-3141	August 2, 1951	250 GPM (.557 CFS)
South Well #2	NA	GR-3184	GR-3142	September 15, 1951	400 GPM (.8912 CFS)
South Well #3	NA	GR-3185	GR-3143	March 25, 1953	400 GPM (.8912 CFS)
South Wells #4 and #5	G-13871	G-13015	NA	November 7, 1994	434 GPM (.97 CFS)
				TOTAL SOUTH	***1,484 GPM (3.31 CFS)***
Polk Street Well #1	G-12736	G-12134	NA	December 19, 1991	897.6 GPM (2.0 CFS)
Polk Street Well #1-4 (includes River Dr.)	G-11243	G-10375	83231(void) (T-10827)	March 8, 1984	421.8 GPM (.94 CFS)
				TOTAL POLK	**1,319.4 GPM (2.94 CFS)**
Valley Concrete (To be transferred)	G-2469	G-2279	31510	October 15, 1962	250.8 GPM (.56 CFS)
				TOTAL POLK WITH TRANSFER	***1,570.2 GPM (3.50 CFS)***
Future Surface Water	S-86398	S-54331	NA	August 10, 2005	2,001 GPM (4.46 CFS)

Total Permitted Flow from Groundwater Sources = 2,803.4 GPM (6.25 CFS) (4.036 MGD)

The total permitted flow for the City at the current rate of 2,803 GPM (4.0368 MGD) provides the equivalent water production capacity for an approximate maximum population of 18,000 (5,680 residential units) at 24 hours/day of pumping or the recommended limit (18 hours/day of pumping) at a population of 13,460 (4,247 residential units) at the current combined rate of leakage and loss (20%). The projected 2035 population of 14,450 can be handled with 19.33 hours per day at the current water rights limit.

The Polk Street Well Field is currently producing up to 1000 GPM, which is 75.8% of its permitted flow. This means that the city will not need the transfer or acquisition of new water rights from additional or existing wells to this wellfield until expansion of the wellfield occurs above 1,320 GPM.

The South Well Field is currently capable of producing up to 400 GPM, which is approximately 27% of its total permitted flow of 1484 GPM. That leaves approximately 1,084 GPM in remaining well capacity under current permit status that can be applied to additional wells in the South Well Field or possibly the Willamette River wells. In order to optimize the total production from the South wellfield, reactivation of South Wells #4 and #5 is planned to add approximately 150 GPM of source capacity, effectively increasing the total wellfield production to 550 GPM (37% of the permitted flow).

In 2012, the certified water rights for the 422 GPM available at the former "old" Main Street Wells #4 and #5 site were transferred to Polk Wellfield (RE: Transfer #T-10827) and are no longer available for other water uses or locations within the city. See the discussion surrounding this transfer below.

Unbeknown to the City, the final proof process, begun in the late 1980's, drastically lowered the allowable rate from the "old" Wells #4 and #5 from 1000 GPM to 422 GPM, a loss of 578 GPM (1.29 CFS) of the available water right. This is due to the fact that, due to water quality concerns, the wells were inactive fro a period of five (5) consecutive years between 1995 to 2000, which by statute, results in forfeiture of a portion of the water right. Unfortunately, the city was unaware of this action until the process had progressed to the point where an appeal or reconsideration of the revised flow rate was not possible under state statute. At the time of the issuance of the certificate, the city's water system engineer and water rights examiner was beginning the process of transferring the full rate of 1000 GPM from these two unused wells to the Polk Street Well Field. Although the loss of over 50% of the original rate from these wells is significant, the remaining duty rate of 422 GPM was none the less transferred to the Polk Well Field (RE: T-10827) in 2012 to supplement the total pumping rate from this field (Total Water Right = 1319 GPM or 1.90 MGD) which is adequate for the current wellfield.

The city has recently assumed control of industrial property formerly owned by Valley Concrete for eventual commercial development. With this property is an existing well and water right for .56 CFS (250.8 GPM). Although there is no plan or intent to reuse the well, the water rights will be transferred to the Polk Wellfield. This rate of water, when combined with the existing water right of 1,319 GPM will create a new total of 1,570 GPM, adequate for the intended ultimate use. The water right will also have to be processed for a change of use from industrial to municipal use in this procedure.

Since the new South Wells # 1, 2, 3, 4, and 5 are all currently located within the existing South Well Field, these wells are allowed to be used within their existing "GR" and "G" permits. The City, however, should update the location of all new wells within this field to the Oregon Water Resources Department to protect the water associated with these permits.

The operational status of the "New" or South Wells #4 and #5, located at the South Wellfield, has been regarded as "inactive" in recent years due to limited production and the past presence of an organic contaminant: Tetrachloroetylene

(PCE) in water produced from these two wells during the late 1990's-early 2000's. Recent testing for the same organic contaminant from these wells, however, has indicated that the level has dropped to well below the applicable maximum contaminant level (MCL) for this constituent. Given that these wells are already developed and equipped with pumping and filtration equipment to lower PCE levels (if present) to below MCL standards, both wells should be reactivated and rechecked for current flow and contaminant levels. Although the potential combined contribution from the two wells could conceivably be as high as 250 GPM, for planning purposes, a maximum combined flow rate of 150 GPM (.33 CFS) will be assumed. When added to the expected delivery rate of 400 GPM from South Wells #1-3, the total South Wellfield production is assumed to rise to 550 GPM (.79 MGD).

Surface Water

The City has one current but unused surface water right for 2000 GPM (4.46 CFS) from the Willamette River. This water permit was allocated in 2005 through a joint effort with the City of Monmouth and is currently planned for development within a 50 year window allowed for municipalities that expires in Year 2050. It is expected thtat development of this source will occur sometime after 2035 and before 2050.

Table 2-3a
Well Pump Data

Well Number	Pump Type	Pump HP	Pump Setting And Pipe Size	Manufacturer/Model Information	Design Conditions
South Well #1	Deepwell Submersible	10 HP	80'-4" T&C steel pipe	Berkeley 6T10-275 stage	200 GPM @ 130' TDH
South Well #2	Deepwell Submersible	10 HP	67'-4" T&C steel pipe	Goulds 6CHC10 stage	210 GPM @ 130' TDH
South Well #3	Deepwell Submersible	7.5 HP	67'-4" T&C steel pipe	Goulds 6CHC7.5 stage	210 GPM @ 130' TDH
South Well #4	Deepwell Submersible	7½ HP	70'-4" T&C steel pipe	Goulds 150H07 stage	175 GPM @ 140' TDH
South Well #5	Deepwell Submersible	7½ HP	70'-4" T&C steel pipe	Goulds 150H07 stage	175 GPM @ 140' TDH
Polk Street #1	Deepwell Submersible	25 HP	42'-5" T&C steel pipe	Goulds 8RJLC-3 stage	350 GPM @ 200' TDH
Polk Street #2	Deepwell Submersible	25 HP	42'-5" T&C steel pipe	Goulds 8RJLC-3 stage	350 GPM @ 200' TDH
Polk Street #3	Deepwell Submersible	40 HP	34'-6" T&C steel pipe	Goulds 8RJHC-3 stage	550 GPM @ 200' TDH
River Dr. Well	Deepwell Submersible	7½ HP	47-3" T&C steel pipe	Grundfos GFI1.50875-4-1	80 GPM @ 200' TDH

Table 2-3b
Maximum Wellfield Capacity (2015)

Wellfield Name	Flow (GPM)
South Wellfield @ Three operating wells	400 GPM
Polk Wellfield @ Four operating wells	1,000 GPM
TOTAL	**1,400 GPM**

All of the wells are drilled into a relatively shallow alluvial aquifer and are generally free from naturally occurring coliform bacteria. All of the well heads are terminated at least 12" above the local finish grade and are adequately sealed. The Polk Street Well Field is located within the Willamette River 100 year flood plain but all four well heads are elevated above this level and the well casing top terminations are at least 18" above the flood level. Each well is equipped with an individual flowmeter and water level indicator (air line). All wells are individually enclosed within a locked and fenced area or wellhead enclosure to preclude unauthorized access and both wellfields are secured within a perimeter fence. The wells in the South Well Field are equipped with individual carbon adsorption systems, to remove tetrachloroethylene (PCE) that were detected in low levels in one of the wells as recently as 2008, although the treatment systems are not in current use. Groundwater quality at the South Well Field is generally acceptable with reasonable raw water levels of iron and manganese. Central chlorination for these wells is performed at the South Booster Pump Station using a flow proportional chlorine gas-feed system.

The wells in the Polk Street Wellfield, however, produce higher raw water levels of iron, manganese, and calcium hardness and prolonged operation of this wellfield formerly led to water quality complaints during the initial (1990-96) years of operation, mostly in the northern area of the city around the airpark. Treatment equipment, consisting of proprietary oxidation-reduction filter media, was installed at the Polk Reservoir/Pump Station during the late 1990's to remove the excessive levels of iron and manganese with moderate success. None of the wells are felt to be influenced by surface water due to the different water chemistry and temperatures observed versus that from the nearby Willamette River and all wells in both wellfields, have been since classified as "groundwater" sources by the Oregon Health Authority. The South Well Field receives their combined electrical service at a single entry point in the booster pump station, transmits power to a central location between the wells and distributes individual power to the five wells from this point. Since 2004, the electrical service at this site has been equipped with an auto-start emergency generator and an automatic transfer switch to run up to all five wells along with the entire booster pump station during a power outage. Currently, the Polk Street wellfield does not have any automatic electrical or mechanical backup facilities of any kind, although a manual transfer switch was recently installed for this purpose and a city-owned portable generator with adequate capacity is available, if needed. Future plans call for a permanent standby 150 KW generator to be placed at this site in the early years of this study period to provide emergency power through a manual switchover. The addition of a second .75 MG reservoir at the Polk Reservoir site provides enough total water storage (1.5 MG) to allow installation and use of a manually switched over generator set at the Polk wells instead of the automatically switch-over unit originally planned as there will be a minimum of eight (8) hours to make the conversion.

In 2007-2008 a new wellfield, consisting of three (3) widely spaced production wells was constructed along side the Willamette River on a strip of ground owned by the city. This wellfield, a joint-cooperative venture of the cities of

Independence and Monmouth, is referred to as the Willamette River Wellfield. The combined "safe" yield from all 3 wells is approximately 1200 GPM, however, current plans call to limit the wellfield to 1000 GPM from two of the three wells (Well #1 and Well #2). Because water obtained from this wellfield has been determined to be "Groundwater Under Direct Influence of Surface Water" or GUDISW, filtration and enhanced disinfection, using ultra-violet light, will need to be performed before the water is chlorinated and available for potable use. The treatment facilities are planned to be located and operated at the City of Monmouth 4th Street Facility with a dedicated transmission main used to convey up to 500 GPM of the water to the Independence South Reservoir/Pump Station.

In 2009, a new well on East Grand Avenue, referred to as the "Park Well" was constructed. This well, a single 8" diameter x 45' depth water well, is equipped with a 15 HP submersible pump with a "safe" design output of 180 GPM @ 80 psi +/- 5 psi. Due to the variable water quality and desirability and acceptability for use in an irrigation setting, this specific well and pump station has been removed from the water system planning process and dedicated towards grounds irrigation at the new 15 acre Independence Ballfield Complex, adjacent to the Polk Wellfield.

Water Distribution System

The city's water distribution system consists of mostly asbestos-cement (AC), cast iron (C.I.), and Polyvinyl Chloride (PVC) pipe with a small percentage of the original steel pipes remaining in service. All pipe installed within the past 15-20 years has been exclusively PVC pipe. Both AWWA C-900 and IPS classifications are currently being used with AWWA type C-900, Pressure Class 150 psi, used as the primary type of new pipe for the water distribution system. The approximate current (2015) distribution of pipe sizes within the water system are as follows:

Nominal Size (Inches)	Total Length (In Feet)
2"	4,366
4"	15,025
6"	71,651
8"	74,706
10"	17,719
12"	2,249

Total: 185,716 feet (35.17 miles)

The water system has adequate isolation valving and fire hydrants throughout the distribution system. In 1994, the City embarked on an ambitious pipeline replacement project that has resulted in the replacement of approximately 14,000 lineal feet of 6", 8", and 10" pipe. Most of the replaced pipe was the original older steel that was between 30 and 50 years in age and had demonstrated considerable deterioration and resulting water leakage. The project resulted in a significant decrease in the amount of unaccounted for (L&L) water. The City has continued to replace selected areas of steel pipe and, as of 2014, the remaining steel pipe comprises less than seven (7%) percent (approximately 13,000') of the total pipe length. Existing services are primarily made from copper pipe between the main to the service meter and the city has begun changing services to

polyethylene pipe. Most of the distribution system is looped and interconnected, where possible, to improve delivery and lessen water quality impacts to the distribution system.

Booster Pump Stations

The City operates three (3) individual booster pump stations with a total of nine (9) booster pumps, seven (7) are electrical drive with two (2) driven exclusively by air-cooled diesel engines. (All of the booster pumps have a common design head condition of 150' TDH (65 psi) (140' actual-with the reservoirs assumed with 10' of inlet head). The outlet head and therefore, capacity, will vary slightly with changes of inlet head (reservoir head), which, with full reservoirs, can increase the total system pump capacity as high as 20%):

South Pump Station: This pump station, built in 2004, at the South Wellfield, was constructed to replace the former aging, inadequate, and flood-prone Main Street Pump Station and is now the primary pump station used for the water system. The current booster pumps in use consists of four (4) pumps: two (2) 30 HP and one (1) 20 HP canned vertical turbine pumps (VTP) along with a recently installed (2014) 10 HP submersible "canned" pump used as a system "jockey" and flow transition pump. All pumps receive atmospherically stored and chlorinated water from the adjacent 1,500,000 gallon steel reservoir (which replaced the Main Street 300,000 gallon reservoir), directly supplied from the South Well Field. Sodium fluoride is injected, proportional to flow, as water exits the pump station towards the distribution system.

The Design flow condition for each pump is as follows:

Booster Pump	Pump HP	Manufacturer/Model Information	Design Capacity/ Head
South Well BP #1 Year: 2004	30 HP Elec.	Flowserve 12CM-3 stage Vertical turbine pump	750 GPM @ 150' TDH 850 GPM @ 130' TDH
South Well BP #2 Year: 2004	30 HP Elec.	Flowserve 12CM-3 stage Vertical turbine pump	750 GPM @ 150' TDH 850 GPM @ 130' TDH
South Well BP #3 Year: 2004	20 HP Elec.	Flowserve 10CM-4 stage Vertical turbine pump	450 GPM @ 150' TDH 500 GPM @ 130' TDH
South Well BP #4 Year: 2014	10 HP Elec.	Berkeley 6TS10-230 submersible (Jockey pump)	180 GPM @ 150' TDH 200 GPM @ 130' TDH

(High Capacity = 2,400 GPM) Normal Total: 2,130 GPM

This site also includes proportional feed gas chlorination and sodium fluoride equipment and an automatically operated diesel engine-driven standby generator (Cummins).

Monmouth Street Pump Station: This pump station, installed in 1976, is equipped with two (2) centrifugal booster pumps, one (1) 25 HP electric driven and one (1) standby diesel engine driven unit. The two booster pumps were retrofitted to the new pump/electrical motor unit and pump/engine-drive around 2000. Water supply is provided from an adjacent 750,000 gallon reservoir which is back-fed for refilling directly from the distribution system. The design flow condition for each pump is as follows:

Booster Pump	Pump HP	Manufacturer/Model Information	Design Capacity/ Head
Monmouth St BP #1 Year: 2000	25 HP Elec.	Paco 2570-7 ESCP(2) -6.75" impeller diameter	500 GPM @ 150' TDH 550 GPM @ 130' TDH
Monmouth St BP #2 Year: 2000	Engine Drive (130 HP)	Berkeley B6JQBH/Duetz BF46913 engine-6-cyclinder ESCP(2) -13.125" impeller diameter	1,500 GPM @ 150' TDH 1,800 GPM @ 130' TDH

(High Capacity = 2,350 GPM) (All units) Normal Total: 2,000 GPM
(High Capacity = 550 GPM) (Electric only)

Polk Reservoir/Pump Station: This pump station, built in 1992, was originally constructed to address residential and possible industrial growth in mostly the northern area of the City. Suction supply is provided from two (2) adjacent 750,000 gallon reservoirs that are filled directly from filtered (for iron and manganese control) and chlorinated/fluoridated water originating from the Polk Street Well Field. The design condition of each pump is as follows:

Booster Pump	Pump HP	Manufacturer/Model Information	Design Capacity and Head
Polk BP #1 Year: 1992	25 HP Elec.	Paco 3070-7 ESCP-6.25" impeller diameter	500 GPM @ 150' TDH 650 GPM @ 130' TDH
Polk BP #2 Year: 1998	50 HP Elec.	Paco 4070-7 ESCP-7.02" impeller diameter	1,100 GPM @ 150' TDH 1,200 GPM @ 130' TDH
Polk BP #3 Year: 1992	Engine Drive (130 HP)	Berkeley B6JQBH/Duetz BF46913 engine-6-cyclinder ESCP(2) -13.125" impeller diameter	1,500 GPM @ 150' TDH 1,800 GPM @ 130' TDH

(High Capacity = 3,650 GPM) (All units) Normal Total: 3,100 GPM
(High Capacity = 1,850 GPM) (Electric only)

(1) VTP-Vertical Turbine Pump
(2) ESCP-End-Suction Centrifugal Pump

Total Booster Pump Station Capacity: 7,230 GPM @ 65 psi discharge pressure (± 5 psi). The maximum capacity from all units with full reservoirs (max. inlet head) is approximately 8,400 GPM. The maximum electric-drive pump capacity is approximately 4,900 GPM. All booster pumps are located ± 10' within the same elevation at their respective locations.

Storage Facilities

As of 2015, there are four (4) ground-level water storage reservoirs in service within the City with a total water storage volume of 3,750,000 gallons (nominal volume).

South Reservoir: This reservoir, built in 2003-04, is a bolted type, glass-lined steel reservoir with a full capacity of 1,500,000 gallons. This reservoir supplies water to the South Booster Pump Station and source water is supplied exclusively from the South Well Field, although water can be back-fed from the distribution system through an auxiliary control valve within the booster pump station. The approximate dimensions of this reservoir are 95' diameter x 28' 6" height. This reservoir has begun to show indications of the loss of coating around the lower interior perimeter and will need service to remediate this situation in the next few years.

Monmouth Street Reservoir: This reservoir was built and placed into service in 1976. It is a coated welded-steel reservoir with a full capacity of 750,000 gallons. The dimensions of the reservoir are 57' diameter x 40' height. From a recent inspection, the reservoir was generally found to be in good condition with a minimal amount of loss of coating. Given the age of this vessel and date of construction in 1976, however, the interior (and possibly exterior) coating is no doubt a "coal-tar" type of coating which may include a lead base. If this is actually the case, the eventual recoating of this tank will require specific safeguards to prevent air-induced transmission of lead to surrounding properties and neighborhoods, adding much to the cost of recoating. This reservoir is back-fed from the distribution system for refill and supplies water to two booster pumps at an adjacent pump station. This reservoir is the city's most western facility and is located behind an existing PP&L substation off Monmouth Street. Most likely, fire protection water to the high school or businesses on Monmouth Street will originate from this site.

Polk Reservoir #1 and #2: These two reservoirs, built and placed into service in 1992 (#1) and 2011 (#2) are bolted-type, glass-lined steel reservoirs (A.O. Smith-Permastore). The nominal capacity of each reservoir is 750,000 gallons with approximate dimensions of 62' diameter x 33' height. During construction of Polk Reservoir #2 in 2011, significant repairs to the foundation and base "starter" ring of Polk Reservoir #1 were performed. These repairs were successful and no further seepage from the reservoir or foundation has been detected since. These reservoirs can also be back-fed from the distribution system for filling as well as directly receiving treated water supply from the Polk Street Well Field.

Elevated Reservoir: An unused 50,000 gallon elevated reservoir maintains a physical connection to the water system, however, the vessel is currently drained and not an active element of the water system. Since the fill elevation (high water level) of the tank is only 110' (48 psig), approximately 30'-40' lower than the active hydraulic gradeline of the water system, any water stored within this vessel cannot be used as an active contributor to normal daily operation within the typical water system pressure range of 55-65 psi. Currently, this vessel is leased and utilized exclusively as a cell transmission tower. Due to the lack of a reliable standby source of water that is capable of gravity water feed directly into the water system, an engineering/seismic study is proposed within the mid-span of this study period. This report will evaluate the current structural condition and seismic stability of the elevated reservoir towards an eventual repair and reactivation as a city used water storage reservoir for emergency use only. Maintaining water potability and quality will be accomplished through a routine exchange of water within the reservoir through the use of a control valve and small booster pump to reinject the stored water into the distribution system at nighttime. (See Figure 2-4).

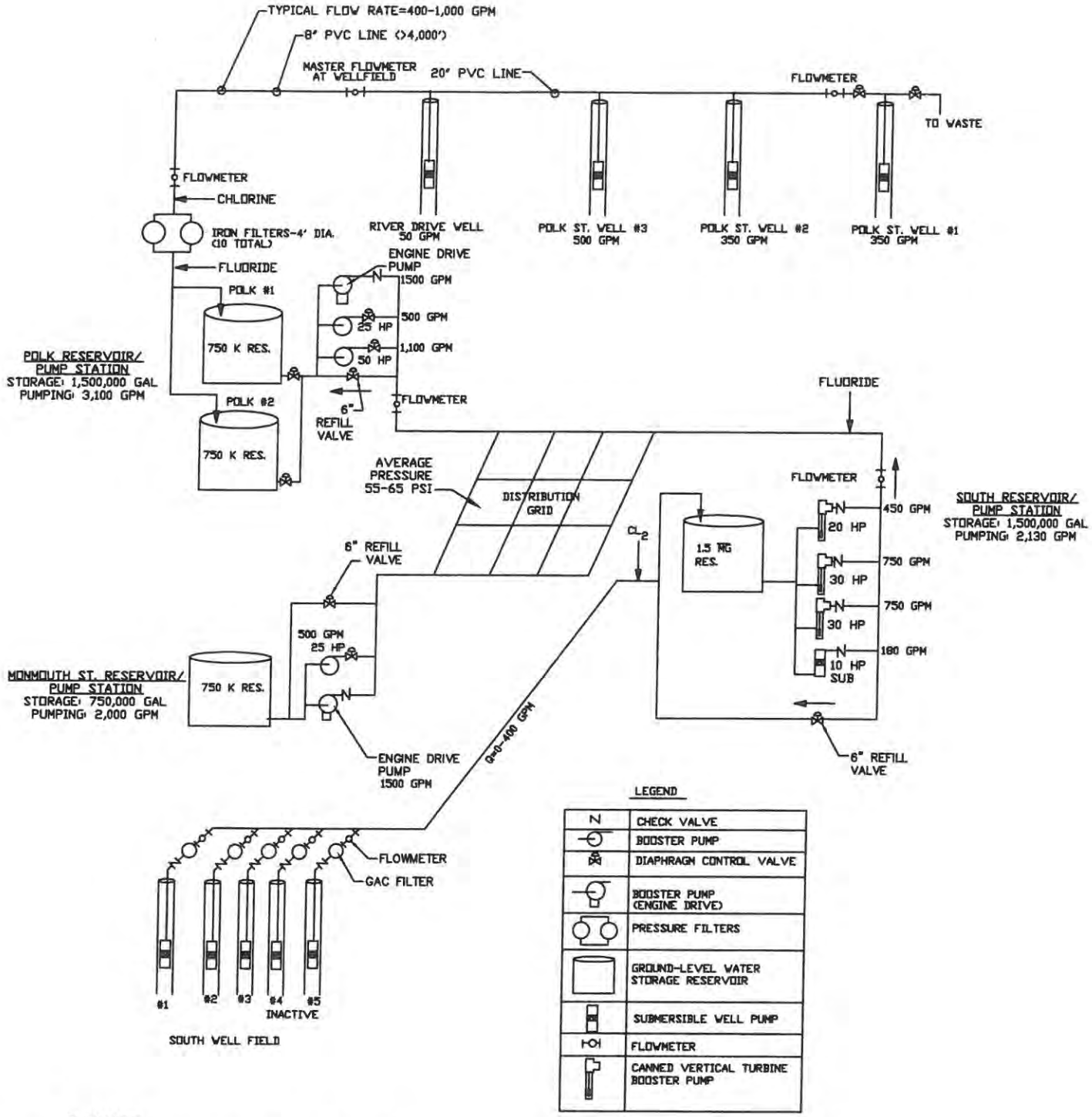
Regulatory Classification

The City of Independence is currently classified by the Oregon State Health Authority as a "Public Water System," specifically a "Community Water System", which is defined as a water system that provides potable water to 15 or more service connections or 25 or more year-round residences. The City's water

system currently serves a population between 3,300 and 10,000 for the purpose of determining water quality monitoring and level of required operator certification. The Oregon Health Authority identification number is PWS ID # 4100399. The required level of certified water system operator for Independence is Water Distribution-2 (WD-2) and Water Treatment-1 (WT-1). The city employs several employees with certification in the required classifications of water distribution and/or water treatment: Ken Perkins, Public Works Supervisor and Matt Carpenter are both certified in Water Distribution-2 and Water Treatment-1. Nicholas Esch is certified in Water Distribution-1 and Water Treatement-1. Matt Carpenter and Nicholas Esch are the primary certified water system operators for the city. Matt Carpenter is listed as the individual in Direct Responsible Charge (DRC) for water distribution and water treatment.

Seismic Considerations

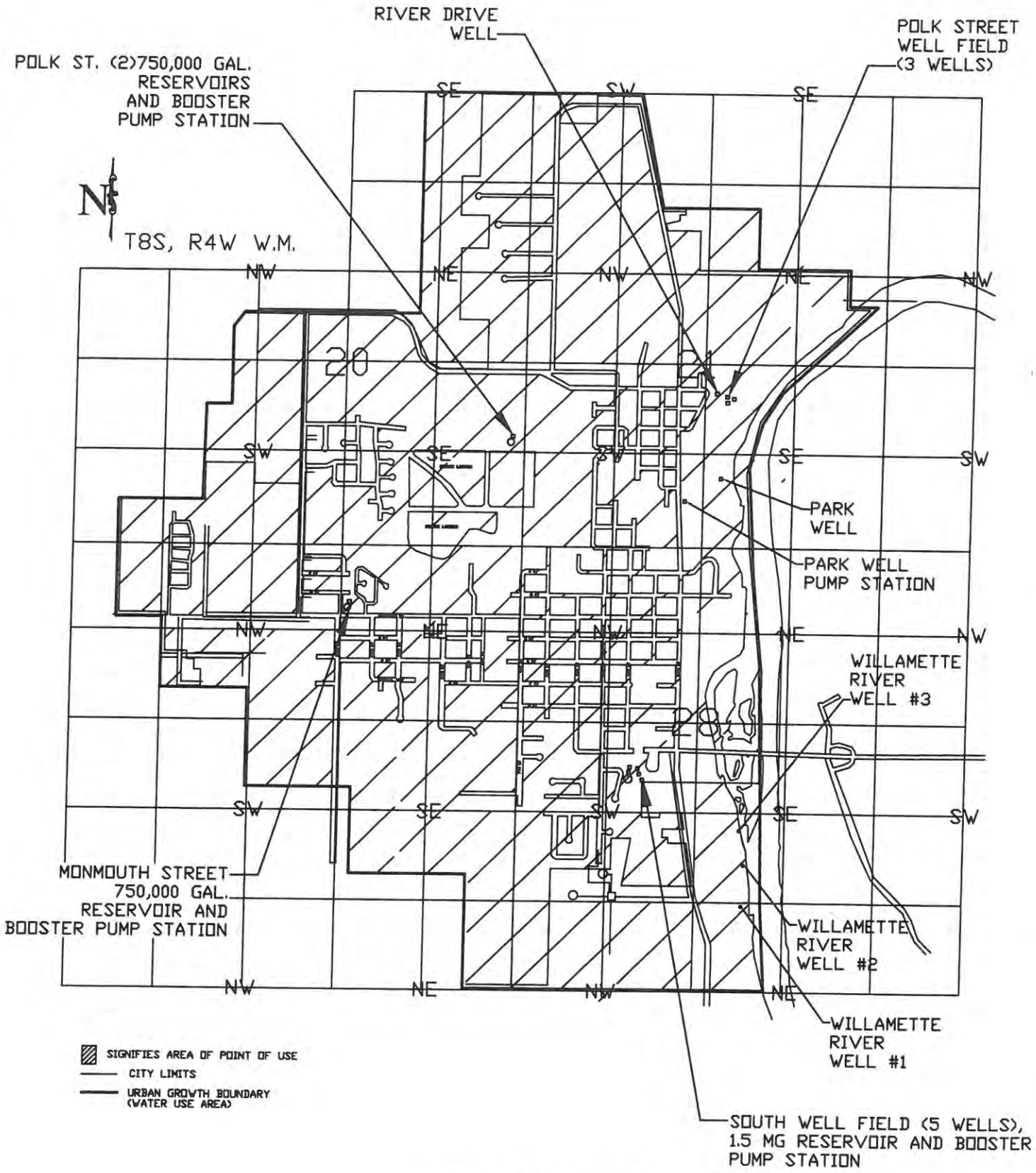
The City of Independence is situated within the Mid-Willamette Valley of Oregon and abuts the Willamette River. Consideration towards a large seismic event, most likely a > 9.0 earthquake on the Cascadia Subduction Zone, has been considered in this plan. Fortunately, there are currently no water system facilities directly on the river and all new pump stations and reservoirs constructed since 1990 have been constructed to the seismic standards in effect at the time for earthquake of Richter 7.5 or higher. The Polk and South reservoirs were constructed using reinforced concrete floors and bolted steel construction to provide flexibility. All pumphouses are cement-masonry-unit (CMU) constructed with vertical and horizontal steel reinforcement. The greatest exposure to seismic damage is felt to be from the wells and underground piping. It is likely that one or more vertical well casings will shear laterally during a seismic event, leaving that specific well unusable as well as inflexible and old underground steel and cast-iron pipe in the distribution system. The city is advised to review the Emergency Plan and incorporate a contingency plan in the event of a large seismic event to address possible well and/or waterline failure. Although newer and flexible PVC pipe should fare well during a large earthquake, it is conceivable that the pipe joints may disengage and pull apart. In a city laid out and with 35+/- miles of waterline such as Independence, it is projected that the city will incur between 20-30 pipeline breaks from shearing and up to 80-100 joint separations. The city must recognize this potential by incorporating a plan for pipeline bypass and isolation. At a minimum, the plan should include bypass and alternate well provisions as well as the activation protocol for the Monmouth-Independence intertie at 4th Street. Additional protective work, such as isolation and flexible coupling installation of pipes exiting reservoirs would be considered. All new reservoirs are equipped with these flexible connections, however, the status of the Monmouth Street reservoir and pump station is not known. In the event of a large seismic event the city should endeavor to maintain as much water storage and emergency well operation as possible as the outbreak of large fires is possible and likely. In order to protect against this potential, the city is advised to coordinate a plan for access to the river or other bodies of water for fire protection with the local fire authority. Electrical power from electric utility providers is also very likely to be down. Additional information can be found in the Oregon Resilience Plan-2013.



SUMMARY

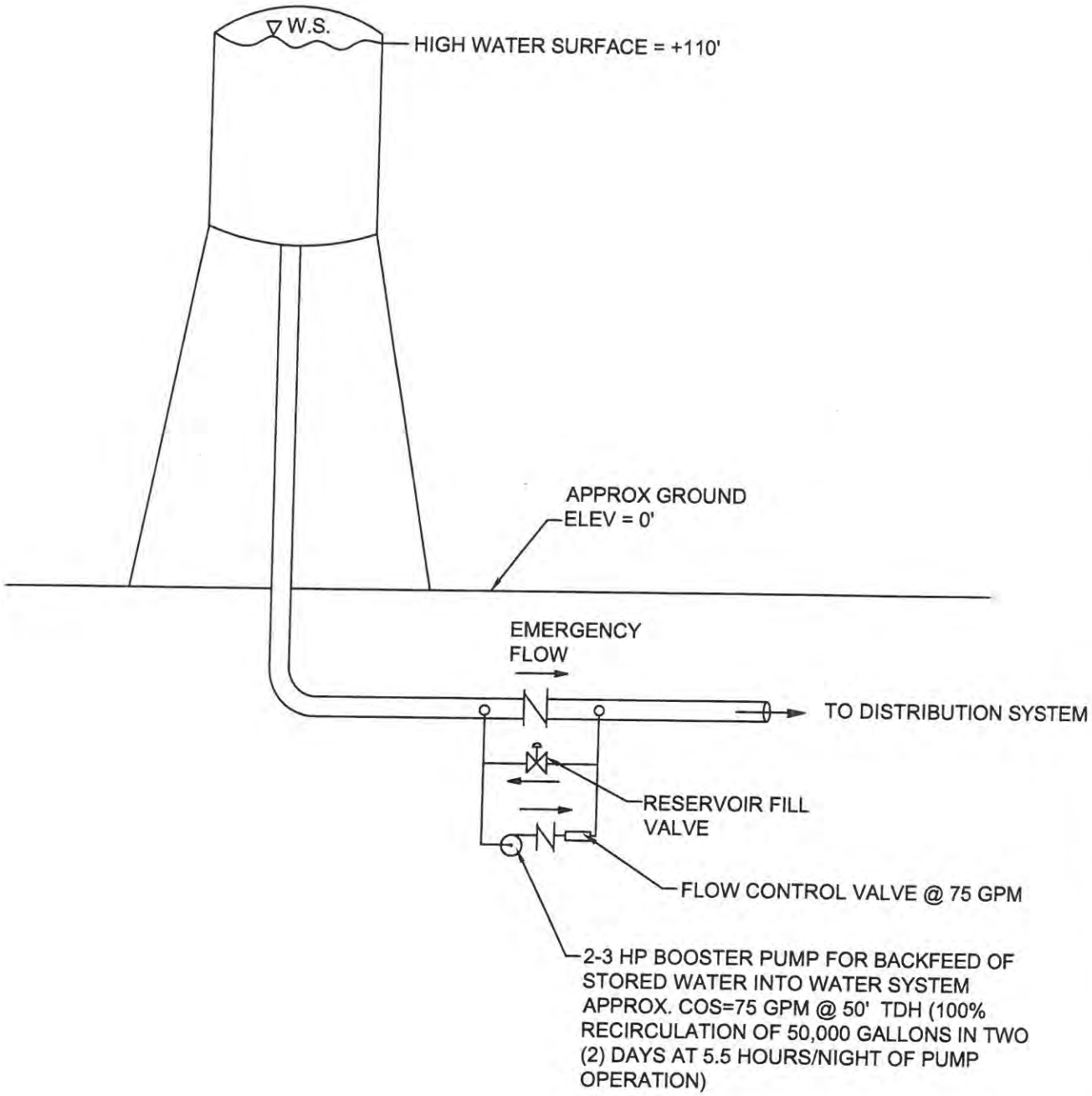
TOTAL SOURCE MAX CAPACITY: 1,400 GPM (7 WELLS)
TOTAL BOOSTER MAX CAPACITY: 7,230 GPM (9 BOOSTER PUMPS)
TOTAL STORAGE VOLUME: 3,750,000 GALLONS (4 RESERVOIRS)

CITY OF INDEPENDENCE
MASTER PLAN UPDATE
WATER SYSTEM SCHEMATIC
2015
NOT TO SCALE
FIGURE 2-1



CITY OF INDEPENDENCE
WATER RIGHTS
PLACE OF USE AND WELL LOCATION MAP
FEBRUARY, 2015
SCALE: 1" = 2000' 0"

FIGURE 2-3



CITY OF INDEPENDENCE
ELEVATED RESERVOIR
CONCEPTUAL WATER REUSE SYSTEM
FIGURE 2-4

State Printing 2560

STATE OF OREGON

COUNTY OF POLK

CERTIFICATE OF WATER RIGHT

This Is to Certify, That VALLEY CONCRETE and GRAVEL COMPANY, INC.

of P. O. Box 38, Independence, State of Oregon, has made proof to the satisfaction of the STATE ENGINEER of Oregon, of a right to the use of the waters of a well

a tributary of Willamette River for the purpose of washing sand and gravel and production of concrete

under Permit No. G-2279 of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from October 15, 1962,

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 0.56 cubic foot per second

or its equivalent in case of rotation, measured at the point of diversion from the stream. The point of diversion is located in the NW¼ NE¼, as projected within Hill DLC 45, Section 28, T. 8 S., R. 4 W., W. M.; Well located 1286.46' South and 599.05' East from the N¼ corner of Section 28.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to - - - - - - - - of one cubic foot per second per acre,

and shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use under the right hereby confirmed, and to which such right is appurtenant, is as follows:

NW¼ NE¼
as projected within Hill DLC 45
Section 28
T. 8 S., R. 4 W., W. M.

The right to the use of the water for the purposes aforesaid is restricted to the lands or place of use herein described.

WITNESS the signature of the State Engineer, affixed this date. APRIL 10 1964

CHRIS L. WHEELER
State Engineer

Recorded in State Record of Water Right Certificates, Volume 23, page 31510

FIGURE 2-5

Chapter Three

Population and Land Use

Table 3-3
City of Independence Historical Population

Year	Population (Actual)
1990	4,425 (Census)
1995	4,875 (PSU Est.) (1.95%/year)
2000	6,035 (Census) (4.36%/year)
2005	8,193 (PSU Est.) (6.3%/year)
2010	8,600 (Census) (.97%/year)
2011	8,600 (PSU Est.) (0%/year)
2013	8,585 (PSU Est.) (0%/year)
2014	8,605 (PSU Est.)
Average Growth Rate (2000-2010)	3.60%/year
Average Growth Rate (1990-2000)	3.15%/year

Population Increase Projection

Since 1990, the population history summarized in Table 3-3 demonstrates that Independence has experienced fluctuating periods of both rapid and relatively flat growth. In previous years, growth from 1980 through 1990 was relatively slow, including years with almost no population increase. This corresponded with a decline of the local and state timber industry and the discontinuation of several local industrial operations. Shortly after 1994, the City began to experience a dramatic increase in population growth including several new residential developments. Between 1995 and 2010, the total population increased by 3,725 persons which represented an overall increase of 76.4%. Annualized, this represents an average yearly population increase of 3.85%. The recent slowdown in the national and local economies was reflected in a zero growth rate between 2010 and 2014 ("flat").

Underestimating or overestimating long term population growth is problematic from a financial and budgeting point of view and with respect to long-term projections of source needs. In order to protect the municipality from unreasonable and excessive projections of population growth while, at the same time, insure the implementation of a realistic projection, the 20 year projection of population increase must include considerations of past historical rates of growth, available land to build, local construction trends, and national/state/local economic trends and conditions. Although the past aggressive rates of growth of 3%-5% are not believed to be realistic for future growth, specific factors indicated that a future growth rate between 2%-3% is feasible and also reasonable. Various sources, including the Polk County Comprehensive Plan (2004), City of Independence Development Code (2010), Polk County Transportation Systems Plan (1998), the Polk County Water Supply Strategy (2005), and the Forecast of Oregon's County Populations and Components of Change, 2000-2040, Oregon Office of Economic Analysis (2010) were consulted in the preparation of this

plan. Growth rates for Polk County and/or the City of Independence varied within these various documents between 1.5% to a high of over 4% per year.

A review of the 20 year population history from 1990 through 2010 indicates that, during that same time period, the city grew by 4, 175 residents, which is an average population growth of 3.37% per year. A review of available land within the current city limits and urban growth boundary (U.G.B.) indicates there is adequate land available for a sustained residential growth rate between 1.5%/year up to 3%/year for an approximate window of 15-20 years. In alignment with the past and projected growth, therefore, as demonstrated in the City's Sewer Master Plan and Development Code and to strike a balance between the high and low growth cycles, a projected annual population growth of 2.5% was assumed in the development of this plan beginning in Year 2014 (to account for the recent growth from the N.E. Apartment Complex).

Table 3-4
City of Independence Projected Populations

Year	Estimated Population	% of Population Increase/Year	Residential Metered Connections	Commercial Metered Connections	Industrial Metered Connections
2013	8,585	NA	2,150	160	33
2014	8,605	NA	2,160	160	34
2015	8,820	2.5%	2,262	162	35
2020	9,979	2.5%	2,559	180	36
2025	11,290	2.5%	2,895	195	38
2030	12,775	2.5%	3,276	210	41
2035	14,450	2.5%	3,615	225	45

Future Service and Study Area

The City currently operates within established geographical and political boundaries that comprise the City limits and the Urban Growth Boundary (UGB). The City is bounded on the east by the Willamette River, the City of Monmouth to the west and the UGB to the north and south. A recent study, prepared by the Mid-Willamette Valley Council of Governments, forecasts the projected population changes, housing, buildable land needs, and economic opportunities in Independence over the upcoming Years between 2014-2030. This report indicated that approximately 181 acres are presently available for residential development with 92.4 of those acres within the city limits and UGB. An inventory also shows that the city will need an additional 332 acres to accommodate the expected residential construction through 2030. The report also stated that the city currently has 2,788 dwelling units and an additional 1,566 units will be needed by 2030 to accommodate the expected growth and that Independence currently has an industrial land surplus of 62 acres, however, a 1.4 acre deficit of available commercial land also exists. An area of proposed growth, known as the Southwest Independence Concept Plan (Figure 3-2), consists of approximately 270 acres and is comprised of a mixture of low, medium, and high density residential construction. In addition, the proposed area of growth includes a "mini-neighborhood" park. Most of the proposed growth area resides outside of the current city limits, but is within the urban growth boundary (UGB). These

considerations were included in the future projections for all classes of construction and water use. Although a potential exists for expansion of the current UGB or a future water-use agreement with a nearby community, for the purposes of this study, only the area within the current UGB shall be considered for water planning, although, from all indications, it is apparent that the city will need to expand the UGB at some point in the future in order to accommodate the projected population growth as infill alone within the current limits will not be adequate.

Land Use

Information obtained from the City of Independence indicates thirteen land use categories within the city limits (Figure 3-1). These are:

1) Residential Single (RS)
2) Residential Medium (RM)
3) Residential Heavy (RH)
4) Residential Single Family-Airpark (RSA)
5) Industrial Light (IL)
6) Industrial Park (IP)
7) Industrial Heavy (IH)
8) Commercial Office (CO)
9) Commercial Retail (CR)
10) Commercial Highway (CH)
11) Agricultural (AG)
12) Greenway Development District
13) Public Services (PS)

Most of the land within the city that is available for development is zoned as Residential or Light Industrial with a smaller percentage of Medium Industrial and Commercial. Most of the projected growth is assumed to occur from residential influx with a smaller percentage of industrial/commercial zoned growth. The City and Polk County have adopted an intergovernmental agreement regulating land use actions within the unrealizable area and any future growth beyond this limit will be subject to County approval. The proposed Southwest Independence Concept Plan (Figure 3-2) was evaluated and included in the water system analysis. Although there is currently not enough information to provide a totally accurate projection of water use in this concept plan, the area and proposed density of construction does provide the ability to generate an informed estimate. For purpose of water master planning, the area within the Southwest Independence Concept Plan has been factored for 200 GPM of average day demand and 600 GPM for peak demands. This equates to the water use for an approximate population estimate of approximately 2,500 individuals. These figures have been used for source analyses and hydraulic modeling of the distribution system for future conditions. Generally, due to its proximity to the South reservoir and pump station and hydraulic similarities, most water utilized in this proposed area will be delivered from the South Reservoir/Pump Station and therefore, the South wellfield. Proper sizing and reinforcement of the distribution system into and from the development area will insure optimization of the delivery and residual system pressure.

South Riverview Development Site

The proposed South Riverview Development site is situated on an existing industrial site, owned and operated by Valley Concrete, one block east of Main Street, south of Riverview Park, and west of and abutting the Willamette River. The conceptual plan (Figure 3-3) includes a mixture of townhomes, apartments, walking trails and playground areas, and retail/office space. Also included in the plan is a potential hotel with up to 40 rooms. The greatest impact to the water system (irrespective of potential fire flow) are the normal day to day uses placed on the water system from typical daily water uses. The average projected daily water use has been calculated to be between 25,000-50,000 (17-35 GPM) gallons per day with peak demands up to 200 GPM. Neither of these demands will present a supply problem to the water system as the daily and peak demands will be served directly from a 10"-12" mainline on Main Street which, in turn, is supplied directly from the South Reservoir/Pump Station. Residual pressures within the proposed development will average 55-60 psig.

City of Independence Zoning, 2010

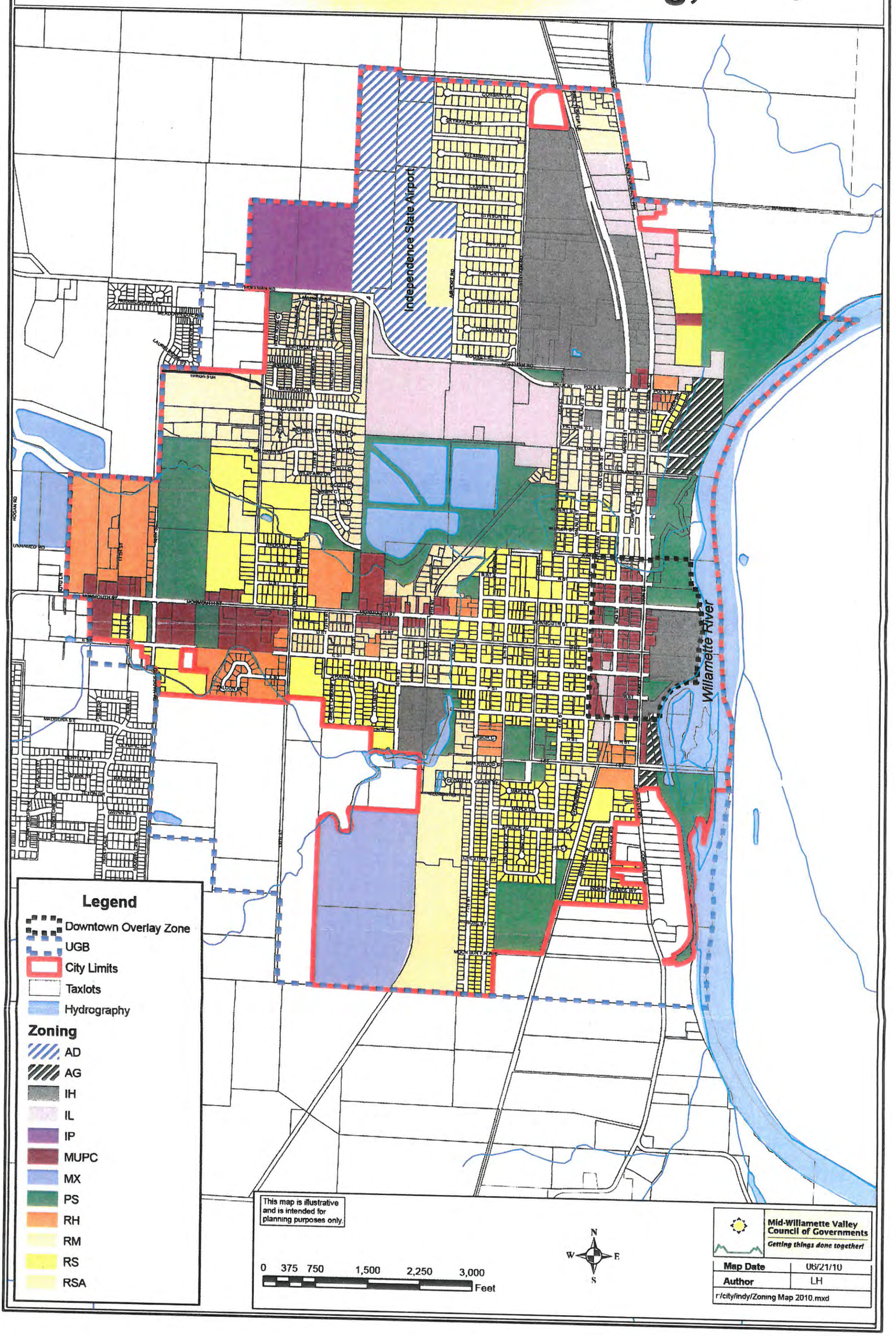
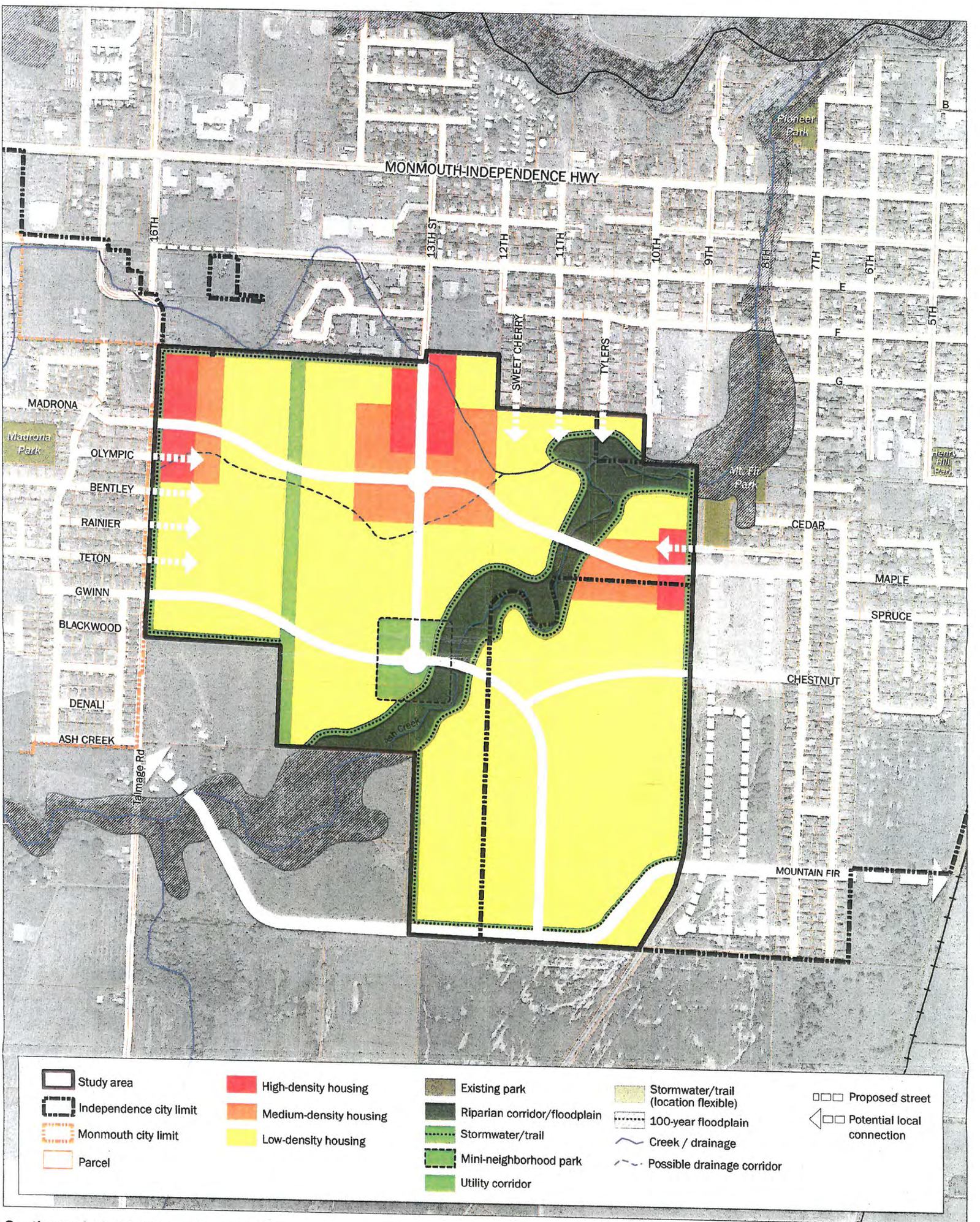


FIGURE 3-1



Southwest Independence Concept Plan

Preferred Alternative

Angelo Planning Group
SERA Architects
Kittelson and Associates
GreenWorks
Cogan Owens Cogan

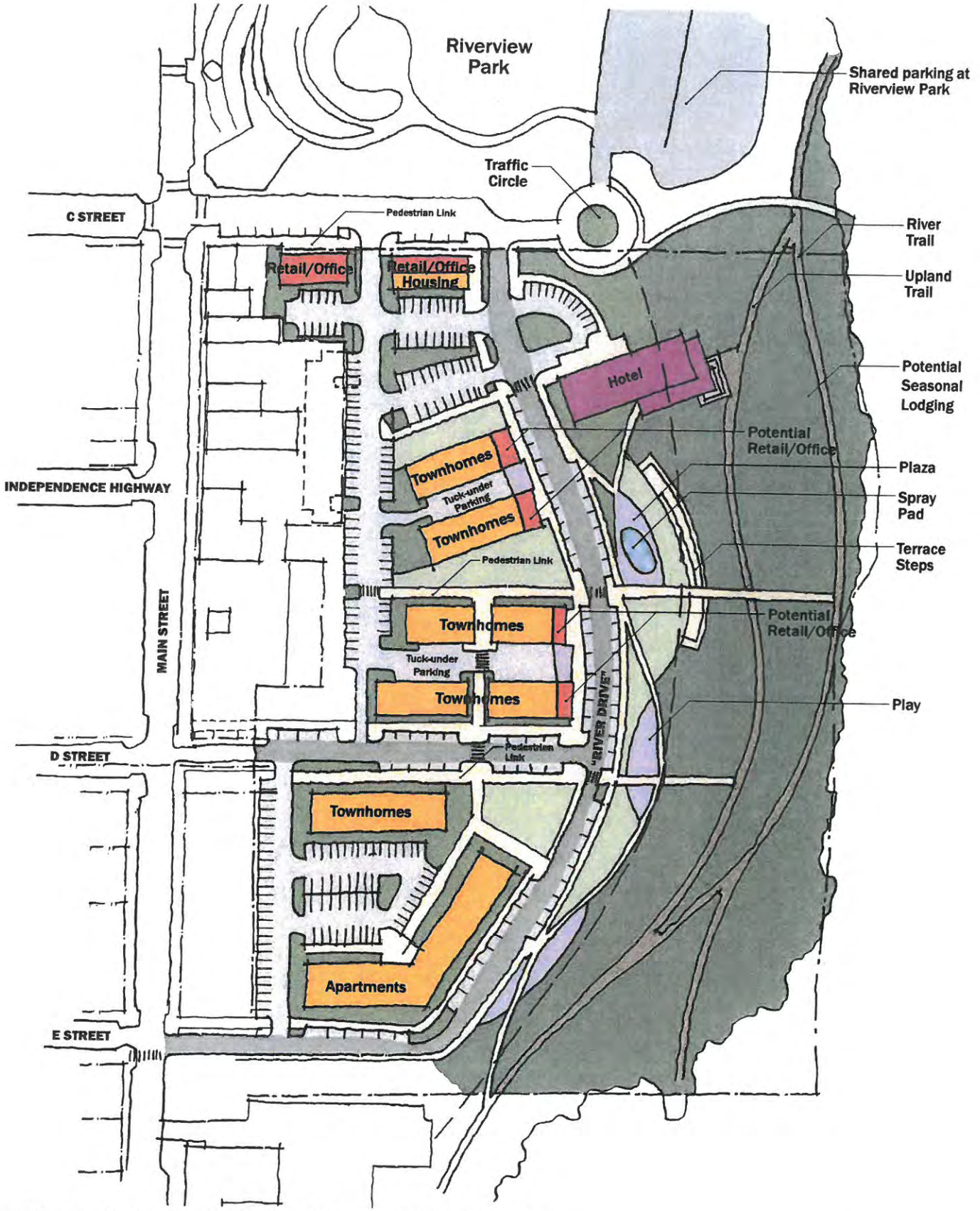
N

0 500 1,000
Feet

1 inch = 200 ft

05/16/12

FIGURE 3–2



Conceptual plan view of the recommended redevelopment scheme for the Valley Concrete site.

FIGURE 3-3